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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,696	03/04/2004	Sung Jun Lee	2336-250	5095

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EXAMINER

KIM, JOANNE H

ART UNIT PAPER NUMBER

2883

DATE MAILED: 04/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/791,696

Applicant(s)

LEE ET AL.

Examiner

Joanne H. Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 and 15-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 15-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “actuator” formed at a predetermined portion of a silicon layer recited in claim 1 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

2. The amendment filed January 18, 2005 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: the new paragraph introduced in the amendment discloses an optical attenuator comprising "a silicon layer carrying said moveable waveguide on a surface thereof; a bonding medium layer having ... a cavity in which the moveable waveguide is received, the first side of the bonding medium layer being bonded to the surface of the silicon layer that carries said moveable waveguide."

The original disclosure discloses that an optical attenuator is divided into a fixed waveguide part connected to an optical fiber and a movable waveguide part located between the fixed waveguide parts (page 3). The original disclosure discloses that the optical attenuator comprises a silicon layer provided with a waveguide. In a step of forming, photosensitive structures having substantially the same size as waveguides connected to optical signal transmission lines (i.e., fixed waveguides of the optical attenuator) are covered by a bonding medium layer thus forming the bonding medium layer with cavities into which the waveguides can be inserted. The waveguides are formed on the silicon substrate and inserted into the cavities of the bonding medium layer.

The original disclosure does not disclose that the silicon layer carries a moveable waveguide and the moveable waveguide is inserted into the cavity of the bonding medium layer. Rather, the original disclosure discloses that the silicon layer carries the

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waveguides connected to the optical signal transmission lines (i.e., fixed waveguides) and the waveguides (i.e., fixed waveguides) are inserted into the cavities of the bonding medium layer.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 15-27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

New claim 15 discloses an optical attenuator comprising "a silicon layer carrying said moveable waveguide on a surface thereof; a bonding medium layer having ... a cavity in which the moveable waveguide is received, the first side of the bonding medium layer being bonded to the surface of the silicon layer that carries said moveable waveguide."

As stated in paragraph 2 above, the original disclosure discloses the optical attenuator comprising the bonding medium layer formed with cavities in which the fixed waveguides formed on the silicon layer are received.

The original disclosure does not disclose the optical attenuator recited in claim 15.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-2 and 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhuler et al. (U.S. Patent No. 6,275,320, hereinafter "Dhuler").

Dhuler discloses a MEMS variable optical attenuator comprising a silicon layer (12) including a waveguide (20) and an actuator (14) movable in a horizontal direction (Fig. 6; column 5, lines 25-28; and column 10, lines 17-20 and 30-35).

Dhuler does not specifically disclose that the optical attenuator includes a bonding medium layer provided with a cavity bonded with the silicon layer and a support layer that is made of glass attached to the bonding medium layer and that the MEMS actuator is a comb type actuator.

It is well known that a hermetic packaging is important for MEMS devices to protect the MEMS devices from hostile external environments and contaminants for long lifetime and better performance. (For example, see Peterson et al. (U.S. Patent No. 6,674,159); Carpenter et al. (U.S. Patent Pub. No. 2003/0021551); Davies et al. (U.S. Patent No. 6,792,182); Blair et al. (U.S. Patent Pub. No. 2003/0161576);

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Nakamura et al. (U.S. Patent Pub. No. 2002/0074086); Callies et al. (U.S. Patent Pub. No. 2004/0190111); and "A Hermetic Glass-Silicon Package Formed Using Localized Aluminum/Silicon-Glass Bonding" by Cheng et al.)

It also is well known that glass is generally chosen as a protection cap for a hermetic packaging because it is mechanically roust, chemically stable, and transparent to light and RF signals which is desirable for optical MEMS devices. (For example, see Peterson et al.; Callies et al.; Blair et al.; Nakamura et al.; and "A Hermetic Glass-Silicon Package Formed Using Localized Aluminum/Silicon-Glass Bonding.")

Further, it is well known that epoxy adhesive, frit glass compound, glass-polymer compound, or polymer-based adhesive material can be used as bonding material in a hermetic packaging. (For exemple, see Peterson et al.; Callies et al.; Blair et al.; Nakamura et al.; and Dawes et al. (U.S. Patent No. 5,991,493).)

It would have been obvious to modify Dhuler to provide a hermetic package in order to protect the MEMS attenuator from hostile external environments and contaminants. That is, it would have been obvious to modify Dhuler to include a glass layer (i.e., support layer) as a protection cap and a bonding layer (i.e., bonding medium layer) for bonding the glass layer to the silicon substrate in order to provide the hermetic packaging. Also, it would have been obvious to use a bonding medium layer formed of a polymer having a high light transmission since it is desirable for optical devices. Further, it would have been obvious to provide a cavity, which has a width and a depth substantially same as those of the waveguide, for receiving the waveguide in the bonding layer in order to provide a proper air tight hermetic packaging surrounding the MEMS attenuator and the waveguide.

Furthermore, it is well known that a comb type actuator is commonly used in a variable optical attenuator. (For example, see Koh (U.S. Patent No. 6,363,183); Novotny et al. (U.S. Patent No. 6,751,395); Mirachy et al. (U.S. Patent No. 6,636,652); and Behin et al. (U.S. Patent Pub. No. 2002/0005976).)

Accordingly, it would have been obvious to modify Dhuler to use a comb type actuator since it is commonly used type of actuator in a variable optical attenuator.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dhuler in view of Peterson et al. (U.S. Patent No. 6,674,159, hereinafter "Peterson").

Dhuler discloses an optical attenuator including a bonding medium formed of a polymer having a high light transmission as discussed above in paragraph 6.

However, Dhuler does not specifically disclose that the bonding medium layer is formed of polydimethylsiloxane (PDMS).

Peterson discloses a hermetic packaging for a MEMS device including a plate (30) and a glass cover lid (42) attached to the plate by a bonding material (50).

Peterson discloses that the bonding material can be a braze alloy, a frit glass compound, a glass-polymer compound, or a polymer-based adhesive material (Fig. 3A; column 8, lines 5-9 and 54-64; and column 10, lines 5-31). Further, it is well known that PDMS is polymer-based adhesive commonly used as optical bonding material. (For example, see Nakamura et al.; Dawes et al.; and Rarbach et al. (U.S. Patent Pub. No. 2004/0057877).)



Accordingly, it would have been obvious to modify Dhuler to use a bonding medium layer formed of PDMS in order to provide improved adhesive material with excellent heat resistance and excellent hermetic sealing properties.

### ***Response to Arguments***

8. Applicant's arguments filed January 18, 2005 have been fully considered but they are not persuasive.

Regarding rejections of claims 1-7, for all "well-known," references, for example, are cited above as requested by Applicant. Therefore, Applicant's arguments are moot.

In response to applicant's argument that Peterson is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Peterson is related to the field of MEMS devices, as stated in page 11 of the amendment, and the present invention also is related to MEMS optical devices (i.e., MEMS actuator). Further, Applicant was concerned with the bonding between two substrates of an optical device (page 5 of the specification) and Peterson discloses bonding materials for bonding substrates of an optical device.

Applicant alleges, in page 12, that "the particular problem with which the inventor of the present invention was concerned is to eliminate the direct bonding between glass and silicon.... Peterson deals with...the integral window is bonded directly to the package without having a separate layer of adhesive material disposed in-between the

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window and the package.... Thus, the matter with which Peterson deals is deemed opposite to the problem of the present invention.” Examiner respectfully disagrees. In contrast to Applicant’s allegation, as stated in the previous Office Action and in paragraph 7 above, Peterson discloses indirect bonding (using a bonding layer) between the window and the package (Fig. 3A; column 8, lines 5-9 and 54-64; and column 10, lines 5-31). Therefore, the matter with which Peterson deals is deemed same to the problem of the present invention.

Furthermore, Applicant alleges that since the classification of Peterson is different from the classification of the present invention, Peterson is not in the field of Applicant’s endeavor. However, MPEP 2141.01(a) states that “While Patent Office classification of references and the cross-references in the official search notes are some evidence of ‘nonanalogy’ or ‘analogy’ respectively, the court has found ‘the similarities and differences in structure and function of the inventions to carry far greater weight.’ *In re Ellis*, 476 F.2d 1370, 1372, 177 USPQ 526, 527 (CCPA 1973).”

### ***Conclusion***

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

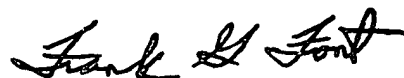
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joanne H. Kim whose telephone number is (571) 272-2139. The examiner can normally be reached on 8:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Joanne H. Kim  
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jhk/FGF



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